FOSS

Water

Concept and Lesson Map

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FOSS Concept and Lesson Map: Water

The Big Picture

In this unit, students begin by examining water as a type of matter with properties that can be observed or measured. After investigating various properties of water and describing them, they use these properties to describe the three states that water is found in on planet Earth. Finally, they use these properties to explore environmental implications in the water cycle and technological applications of water for human use.

Eliciting Student Ideas

Goal: Uncovering student ideas about water.

Use new Pre- and Post assessments with accompanying rubrics.

Investigation 1: Water Observations

Goal: Water has characteristics that can be observed or measured. These are called properties. See last paragraph of page 7.

Part 1:
Looking at Water

Observe and record how water behaves (properties).

IQ: How does water interact with four different surfaces?

Part 2:
Surface Tension
Recognize surface tension as a property of water that can be changed.

IQ: How does the addition of salt and soap to water effect surface tension?

Part 3:
Water on a Slope
Change surface slope and size of water drops to observe differences in water movement.

IQ: How does the slope of the surface and/or the size of the drops effect their movement?

Investigation 2: Hot Water, Cold Water

Goal: Changing the temperature of water may change its properties (density, state - solid, liquid, gas).

Part 1:
Build a Thermometer
Build a thermometer and observe water's contraction (occupies less space) when cooled and expansion (occupies more space) when heated.

IQ: What happens to the amount of space that water occupies when it is heated or cooled?

Part 2:
Sinking and Floating Water
Observe that when water is heated or cooled its sinking/floating behavior also changes (because of changes in density).

IQ:
How does the temperature of water effect its sinking/floating behavior (density)?

Part 3:
Water as Ice
Observe that water, in contrast to most matter, expands when it freezes and therefore floats (is less dense).

IQ: How does freezing effect how much space water takes up (volume) and its sinking/floating behavior?

Investigation 3: Water Vapor

Goal: On Earth, water evaporates at different rates based on temperature and surface area. Water also condenses from vapor back into a liquid.

Part 1:
Evaporation
Observe that a wet paper towel exposed to the air loses mass as the water evaporates compared to a wet paper towel in a sealed cup.

IQ: What happened to the water in each cup?

Part 2:
Evaporation Locations
Measure the temperatures in different locations of the classroom and observe the rates of evaporation of water in cups at four locations.

IQ: What effect does air temperature have on the speed of evaporation?

Part 3:
Surface Area
Observe that water with a larger surface area exposed to air evaporates faster than water with less surface area exposed to air.

IQ: What effect does the size of the open surface of water have on the speed of evaporation?

Part 4:
Condensation
Observe that water vapor condenses onto cups of ice water but not onto cups of room temperature water.

IQ: What conditions cause water to move out of the air and onto the surface of an object?

Investigation 4: Waterworks

Goal: Understanding the properties of water allows humans to apply them to meet our needs and solve our problems (technology).

Part 1:
Water in Earth Materials
Observe that as water travels through different Earth materials (soil and gravel) they hold the water differently.

IQ: What happens when you pour water through different Earth materials?

Part 2:
Water Wheels
Design, construct and refine simple water wheels to do work.

IQ: What is the best design for a water wheel that will efficiently do work (lift objects).

Part 3:
Water from Home
Examine water samples from various sources to observe properties of water quality.

IQ: What are some properties of water that effect its quality for human uses.

Part 4:
Your Own Investigation
Students review properties of water and design an inquiry to answer their own question.

IQ: Based on what we've learned so far about properties of water, what more can we learn by designing our own investigations?

Further Reflections

Goal: Provide opportunities for reflection on learning about water.

Use new Pre- and Post assessments with accompanying rubrics.

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